



Air Diffusion System for Airports

As individual as your requirements

Table of contents

Air Diffusion Systems	3-4
Displacement Systems	5-26
Induction Displacement Systems	27-30
Mixing Systems	31-36
References Airports Projects	37-38
Contact Strulik.....	39

„More comfort, less energy“



Air Diffusion Systems for Major Airports

The ventilation and air conditioning of large and extensive designed buildings have very special requirements concerning to the design of engineers and architects. To meet the ventilation requirements in respect of efficiency, comfort, economy and design usely you will find no standardized components the application as well as use of standardized product are rarely possible. For many years Strulik has concentrated its activities in the field of tailor made solutions for airports and offers a wide range of assistance to architects, design engineers and contractors in order to meet all the above mentioned requirements.

During the last few years Strulik offered its “Design Assistance and Supply Service” to design engineers, architects and contractors involved in the following Airports:

- Heathrow Airport, London, Terminal T5A, T5B, T5C and TTS system.
- Heathrow Airport, London, Terminal T2B
- Gatwick Airport London, North Terminal, Baggage reclaim
- Stuttgart Airport, Terminal 3
- Munich Airport, Terminal 2
- Rotterdam Airport
- Turkmenbasi Airport, Turkmenistan

Strulik´s Design Assistance and Supply Service

The sample below shows the very specific and unique cooperation between architects, design engineers and contractors on one side and Strulik on the other side for Heathrow Airport T5.

Strulik engineers worked on the design of the units in Duisburg including frequent meetings with the architects and the client’s engineers at Heathrow. More than 90 percent of the units were developed specially for the project. All those units were tested to ensure proper performance. CFD (computational fluid dynamics) studies were also called upon to improve some of the performances. The CFD studies were performed by Strulik’s co-operation partners Innigus-GTD of Dresden. Noise, air movement and pressure loss tests were performed by Strulik as well as at the Technical College of Cologne.

Especially in the air conditioning of airports displacement systems become more and more important, because they give a big contribution for increasing comfort and reducing costs of operation.

In every stage of the process Strulik takes over an important role of optimizing the functionality and efficiency of airport terminals. The range of Strulik activities in supplying airport air diffusion systems comprises:

Preliminary planning

- Elaboration of basic proposal

Design stage

- Calculation of cooling loads and air flows by means of room simulation
- Selection, rating and positioning of air terminal devices
- Design of air terminal devices in cooperation with design engineers and architects
- Investigation of air velocity and temperature distribution in occupied zones

Construction phase

- Manufacturing and testing of prototypes and mock ups
- Manufacturing and supplying of air distribution terminals
- Assistance in commissioning

Completion and handover

- Assistance in commissioning

Displacement Systems

Air is supplied at low velocity and level to the space. Room-supply air temperature difference is limited to 3-4 K. Cold air spreads above the floor and is warmed up by people or other heat sources. The air then moves up by natural convection and is extracted at high level. This system is only for cooling. The following options of diffuser installation are possible:

- In-wall installation
- Free floor standing
- In raised floors
- Integration into columns (wrap around)
- Integration into other functional elements (counters, escalators etc.)

Induction Displacement Systems

This system works similar to the above, but due to the special construction of the diffuser a higher differential of room to supply air of 8-10 K cooling can be used. This will allow for the supply of lower air flows at higher cooling loads.

Mixing Systems

The air is supplied with higher velocity and higher temperature differences between supply and room air (8-12 K cooling and up to 15 K heating). Diffusers are installed at high level in the walls or in the ceilings. The air velocity and temperature must be reduced to allow comfort conditions in the occupied zone. Mixing systems are used for cooling and heating. Different types of supply air diffusers can be used, such as:

- Swirl diffusers
- Adjustable swirl diffusers (different air flow pattern for heating and cooling)
- Adjustable jet nozzles (with and without displacement section or integrated swirl)
- Combinations of jet nozzles swirl nozzles and displacement sections

Options for visible installation of displacement diffusers into walls

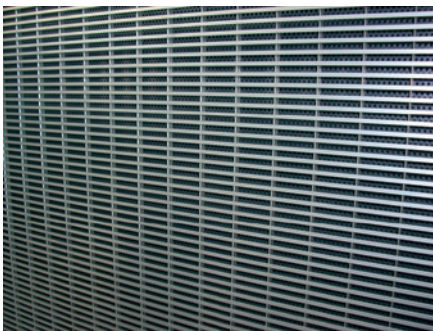
In-wall installation is the normal system to integrate displacement diffusers, but large air flows require big areas which are normally not available. Moreover big concourses cause problems with the “near zone” and the “penetration depth”.

Also the protection of big front faces against damage is a problem.

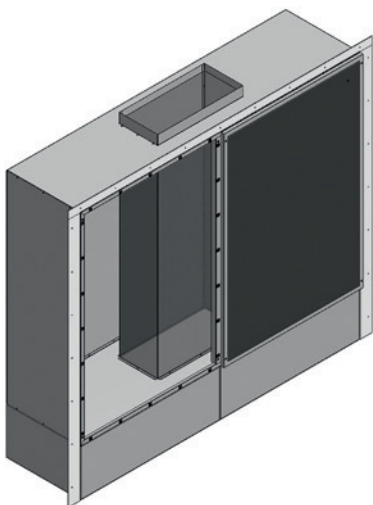
Therefore these wall diffusers are used mainly in transition areas and also mostly in a modified version.



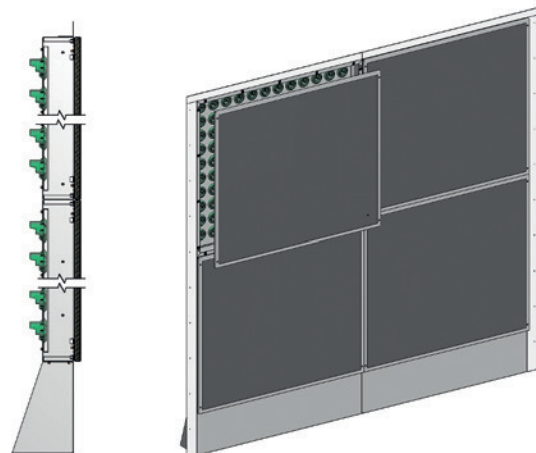
Heathrow Airport, London, Terminal 5A



Shockproof stainless steel LSE front grill. Different sizes of wire and free area are possible.



In-wall displacement diffuser with plenum



In-wall displacement diffuser front face for installation onto plasterboard plenum

Another possibility is the installation of 500 to 800 mm high continuous running wall fascia with a continuous plenum of small depth, built from plasterboard with a front face made of shockproof stainless steel LSE grill. Here dis-

placement diffusers with internal air distribution duct, fixing frame for face plate and front face made of 2 layers of perforated plate with flame resistant foam between the panels are fixed with clips and secured with screws.



Heathrow Airport, London, Terminal T5A

Diffuser with additional shockproof front grill of stainless steel LSE wire grill



In-wall displacement diffuser solution. Plenum built by customer between partition. Removable front face installed in fixing frames



Heathrow Airport, London, Terminal 5A

Options for non-visible installation of displacement diffusers into walls

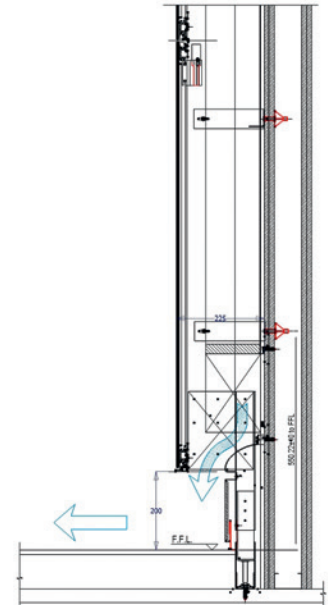
The units shown below are installed as wall lining diffusers in the space between primary wall and front wall panel. The air is supplied through small integrated swirls built into a

200 mm recesses plinth. This page details a unit with air flow of 350 m³/h. The diffusers are not visible.



Heathrow Airport, London, Terminal T5A

Non visible installation of air terminal devices as wall lining diffusers in the space between primary wall and front wall panel.

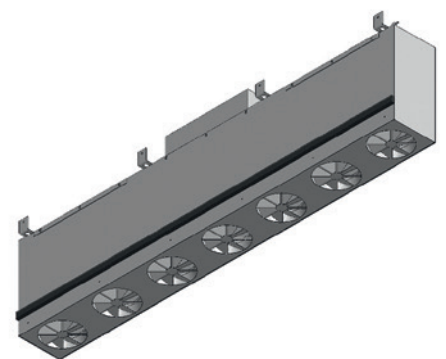


The air is supplied through a 200 mm high plinth



Heathrow Airport, London, Terminal T5A

Diffusers supplied from a header duct

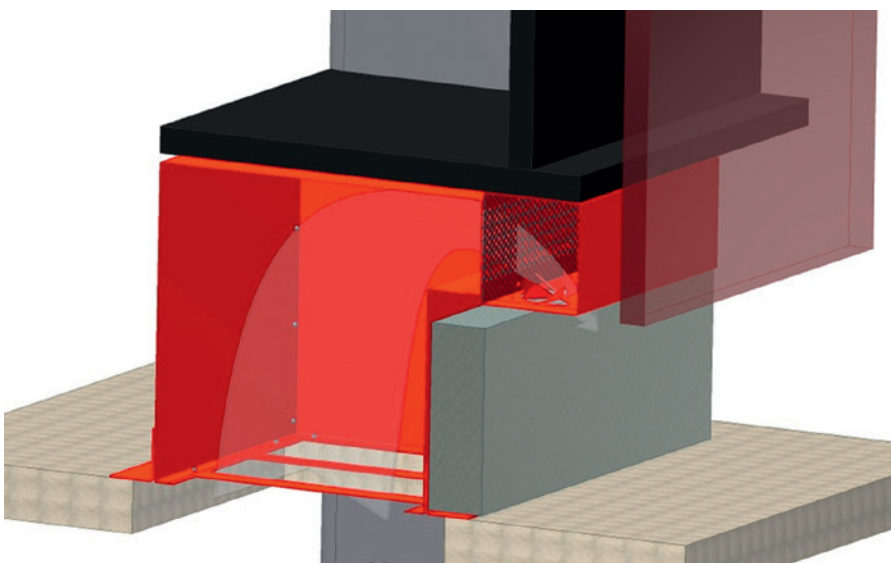


Wall lining diffuser with integrated swirls at the bottom. Air flow about 90 l/s per meter



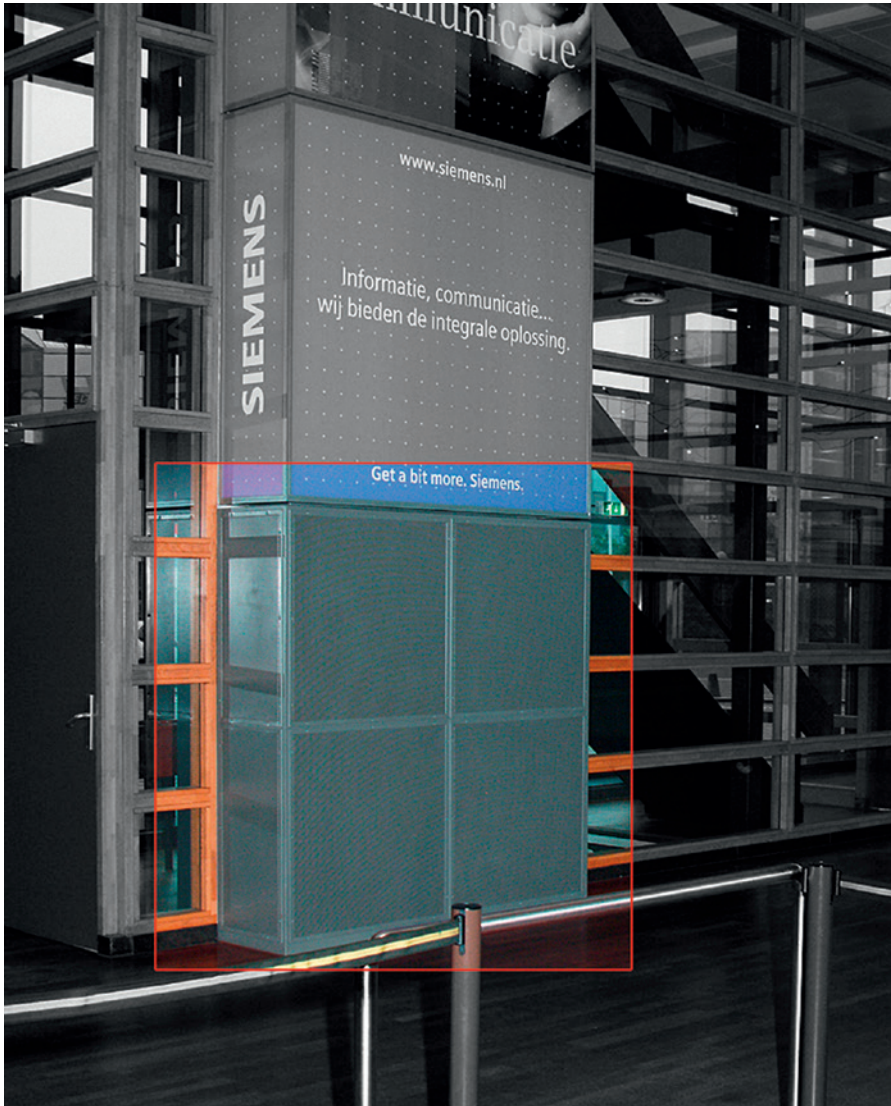
Heathrow Airport, London, Pier 2B North

Wall lining diffusers with air supplied through the raised floor.



Diffuser cross-section
Air supply through the raised floor

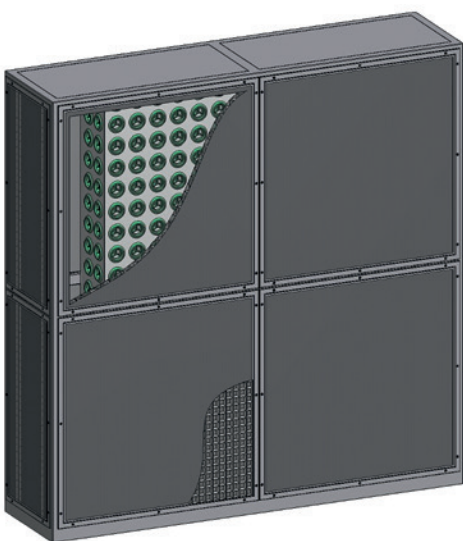
Options for installation of displacement diffusers in front of walls



Rotterdam Airport

Displacement diffuser, three sides active, with steel profile frame construction and removable front panels, made from perforated plate, reinforced on the backside by a heavy grid. Air distribution by a special air distribution duct inside.

Surface: Powder coated



Free standing displacement diffuser 2 x 2 x 0,3 m, the air is supplied from the floor.

Option of installation of diffusers into column casings provided by customers

Column diffusers

Special displacement diffusers can be integrated into the column casing as shown in the example below. This procedure requires good coordination between the suppliers of the columns and the supplier of column diffusers.

Alternatively the displacement diffuser can be built as a combined functional and design element and supplied completely by the diffuser manufacturer. The next page shows such a diffuser that was built in two parts. The diameter is 918 mm and the height is 4.080 mm.



Heathrow Airport London, Terminal T5A



Adjustable displacement diffuser for heating and cooling mode

Displacement diffuser of quarter round shape integrated into a fourpart stainless steel column casing

Option of combined column casing and displacement diffuser

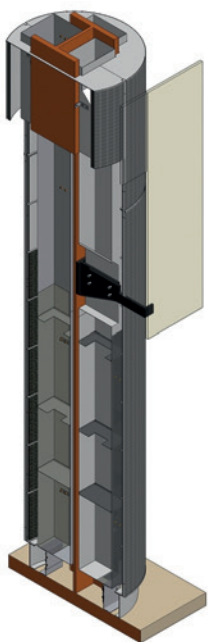


Heathrow Airport, London, Terminal T5A

LSE column diffuser casing as combined functional and design element. Height 4080 mm, diameter 918 mm, plinth 200 mm. Active height 2000 mm. Air flow 700 l/s



Column casing built of two parts, connected by a 20 mm wide profile. Connection to the duct system from the top.



Supply duct and air distribution element fixed to the steel column profile.

Three steel ducts supply the air to the diffuser front face

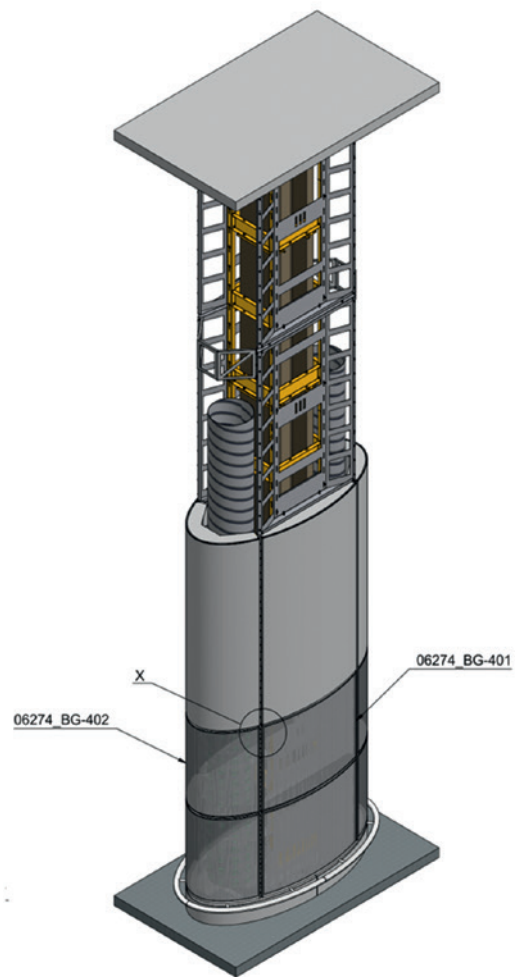


Option of combined column casing and displacement diffuser

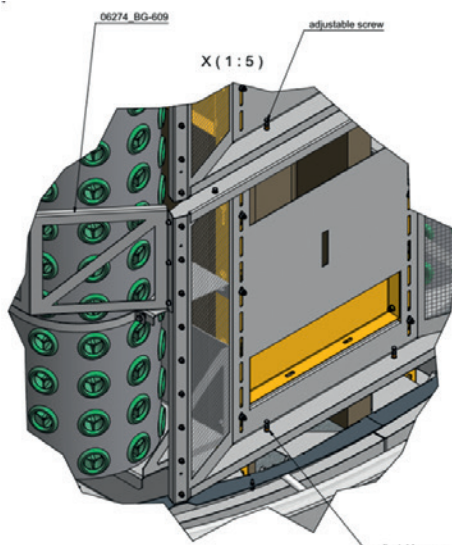


Gatwick Airport, London

Elliptical displacement diffuser 2 x 1 x 8 m in Gatwick Airport, South Terminal, Baggage Reclaim.



Elliptical displacement diffuser construction scheme



Construction detail of displacement subconstruction



Gatwick Airport, London

Framework and Subconstruction for elliptical displacement diffuser

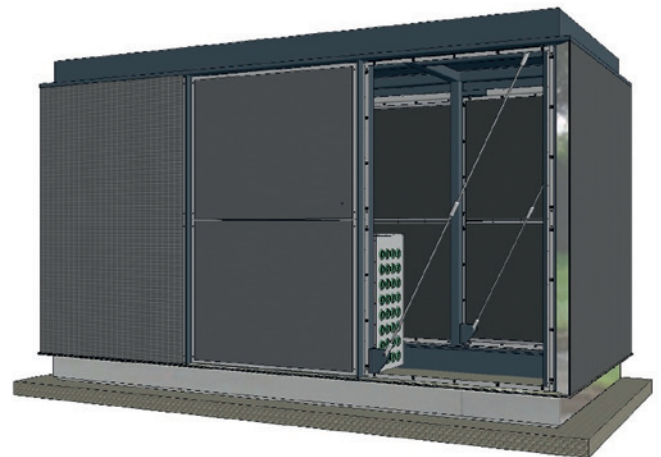
Option for free standing diffusers

Free standing diffusers are a simple way of ventilating large floor areas. Depending on the accepted size of the diffuser air volumes of 1.500 to 15.000 m³/h can be supplied. The shape of the diffuser can be round or rectangular. The rectangular shapes are most suitable because they allow the integration of display panels, advertising boards or fire hose reels. The active height should not exceed 2 m.



London Airport, Terminal T5A

Free standing diffusers of 1,5 m, 2 m and 3 m length, 1 m width and 2 m height with reinforced LSE front grill are installed on Apron, Gate and Departures Level at Heathrow T5.



The internal air distribution duct guarantees an equal air flow to the diffuser front panels. These are mounted in frames and can easily be removed. The LSE front grill is an excellent protection against damaging.



Heathrow Airport, London, Terminal T5A

Free standing diffuser with display panel on top.

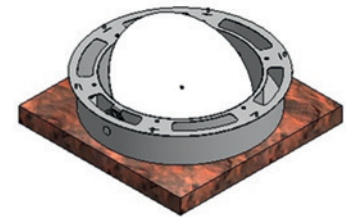
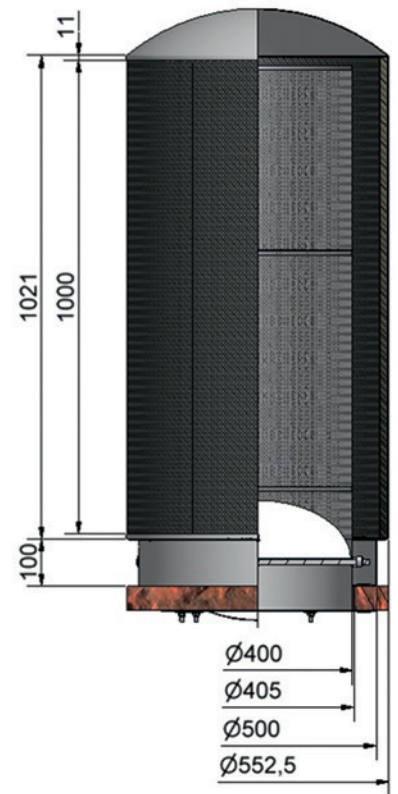


Heathrow Airport, London, Terminal T5A

Free standing beacons of 4 m length, 1,5 m width and 2 m diffuser height, with display panel and zone indication. Air flow between 1.700 l/s and 3.950 l/s

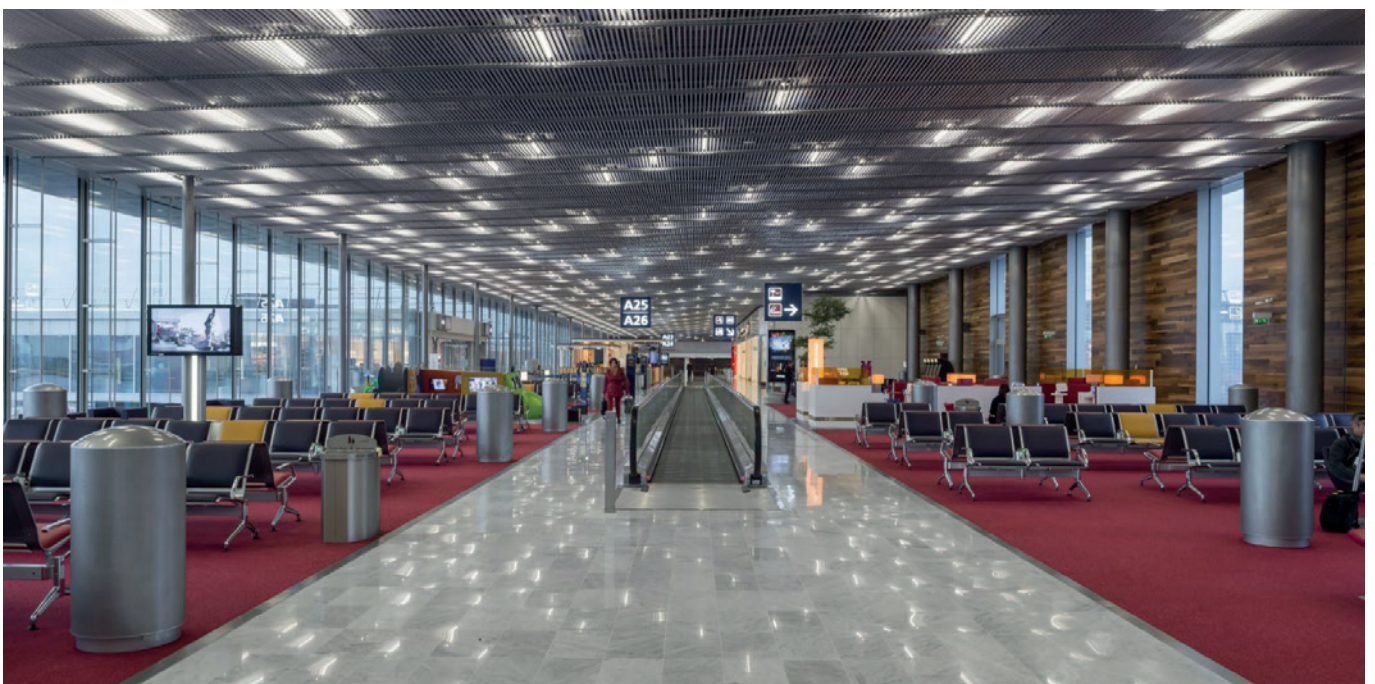


Diffuser steel frame construction with installed air distribution duct and fixing frames



Heathrow Airport, London, Terminal 2B North

Free standing binnacle diffuser on departures level of Terminal T2B North.
Active height 1000 mm, diameter 550 mm, plinth 100 mm. Airflow/unit: 430 l/s
or 1550 m³/h.



Airport Paris Orly, South Terminal, East extension, Gate seating area



"Coffee Table Diffuser" as displacement diffuser between the waiting area seats. Measurements 365 x 1086 x 450 mm
Airflow/unit: 300 l/s or 1080 m³/h.

Heathrow Airport, London, Terminal 5C Departures Level

"Coffee Table Diffuser" with integrated electric socket



Heathrow Airport, London, Terminal 5C Departures Level

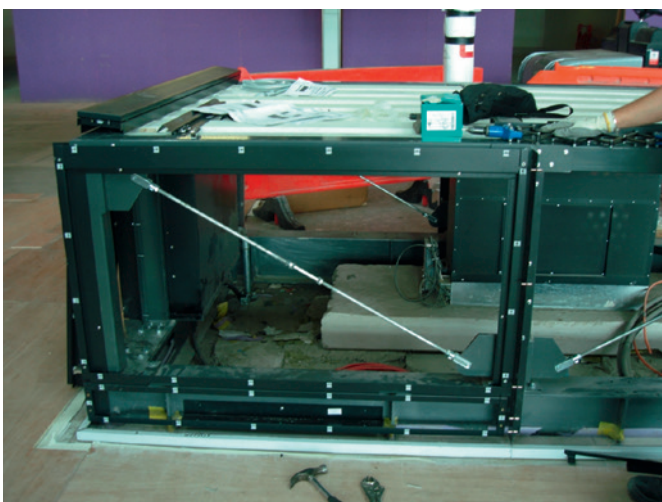


Heathrow Airport, London, Terminal T5A

Free standing IDL diffuser on Gate level, which can be used as writing desk too.
Dimension 3 x 2 x 1,05 m, some of which with fire hose reel on one short side.



Installation of fixing frames into the steel frame construction.



Heathrow Airport, London, Terminal T5A

Fixing of the front panels, which are built of two especially perforated plates with a layer of non-inflammable foam in between.



Heathrow Airport, London, Terminal T5A

Option of diffuser integration into other functional elements

There are different alternatives of integrating displacement diffusers. Diffusers with suitable front faces, like LSE stainless steel grills can be integrated into the plinth of the check-in and booking counters. In this case the diffusers are used as functional and as design element.

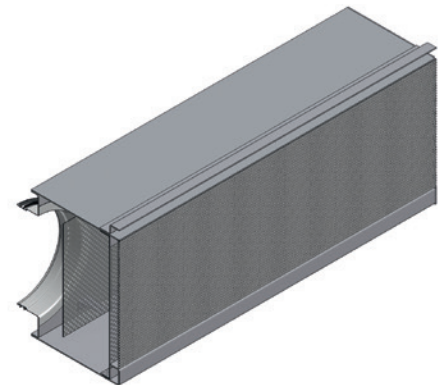
Larger air volumes can also be supplied, when the outer wall of the conveyor belt station can be used for supplying air.



Stuttgart Airport, Terminal 3

257 mm high LSE front grill with 30 mm plinth and 16 mm shadow gap used as plinth diffuser and decorative plinth element. Check-in counter with active elements on the long side and blind elements on the short side.

Same design for active and non-active elements.



Plinth diffuser with stainless steel LSE grill. Supply air spigot from the back or from below.



Decorative blind elements on the doors.

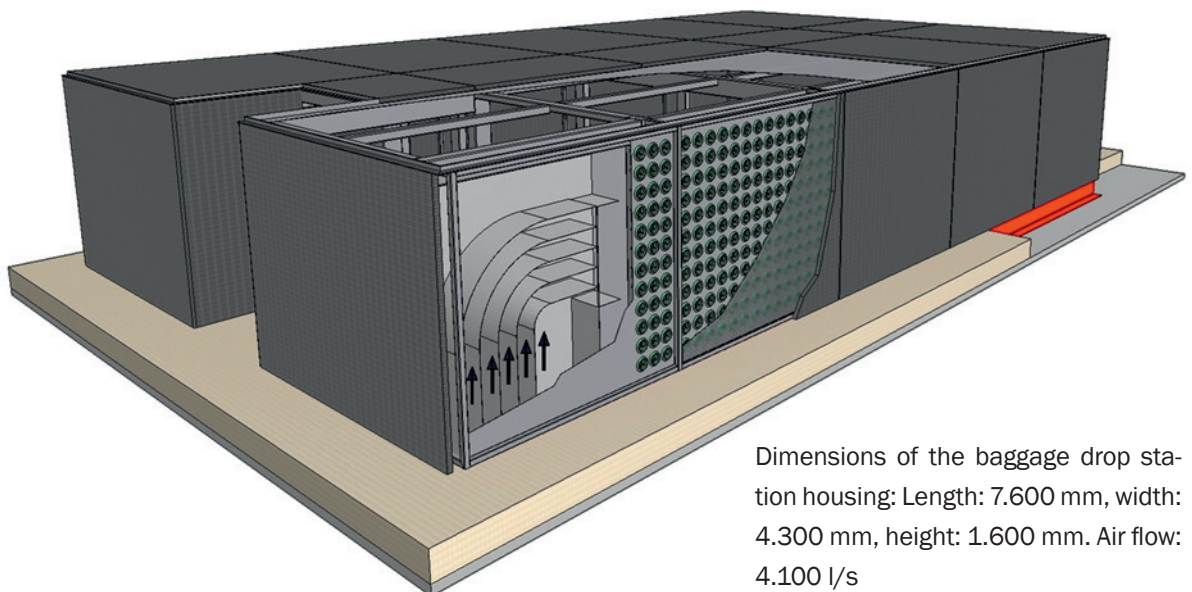


Stuttgart Airport, Terminal 3

Displacement diffusers are integrated into the housing of the baggage drop station at the end of the check-in counter line. Stainless steel frame construction with diffuser plenums are installed in the three outside walls. Walls and top side are panelled with shockproof stainless steel LSE grills.



Connection detail of the removable stainless steel LSE front panels.

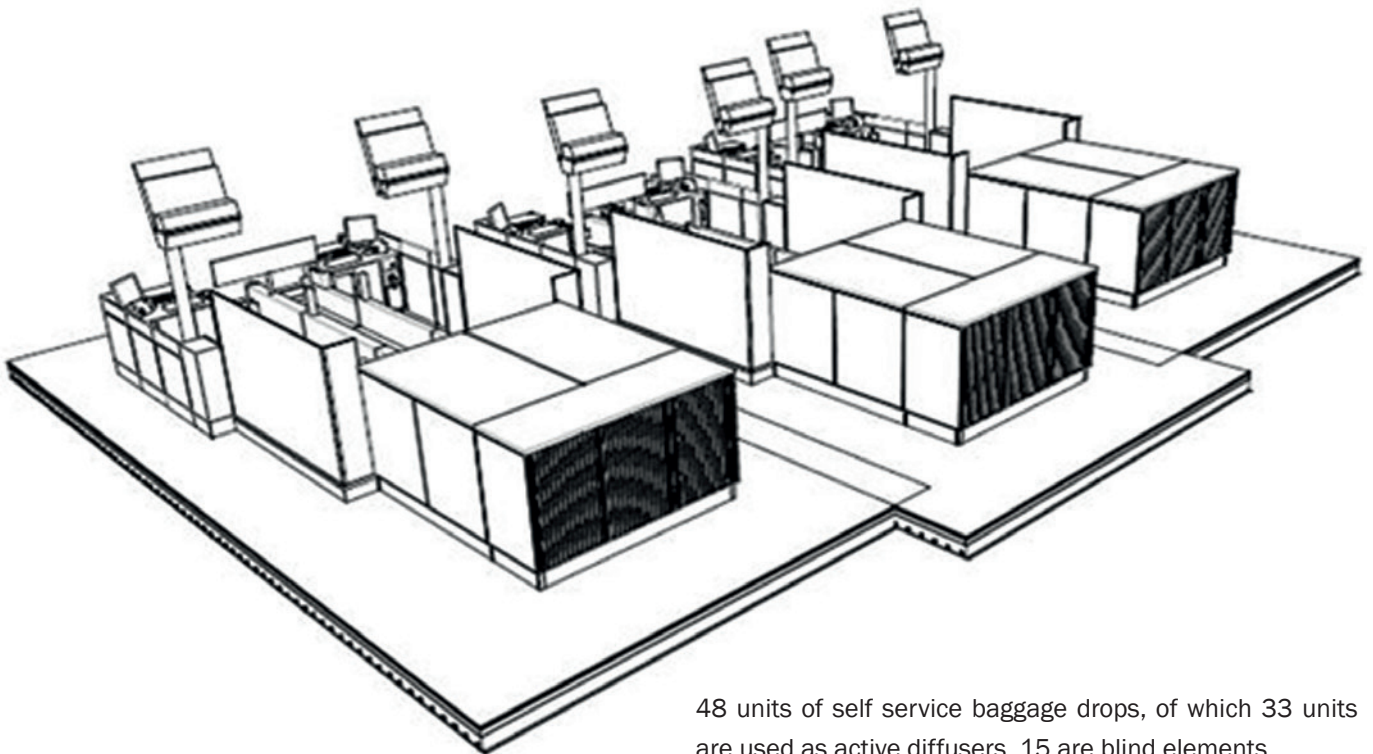


Dimensions of the baggage drop station housing: Length: 7.600 mm, width: 4.300 mm, height: 1.600 mm. Air flow: 4.100 l/s



Heathrow Airport, London, Terminal T5A

Displacement diffusers in the back side of free standing self baggage drop counters. Size of the three-part diffuser front face: 2.253 x 1.135 mm, air flow 570 l/s per unit.



48 units of self service baggage drops, of which 33 units are used as active diffusers, 15 are blind elements.



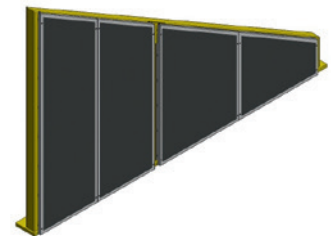
Heathrow Airport, London, Terminal T5A

Displacement diffuser front face installed under escalator. Plenum build by the building contractor with air distribution duct inside.



Stuttgart Airport, Terminal 3

Displacement diffuser under escalator. Front face in one part and self-supporting. Steel plate plenum box behind the LSE grill.



Diffuser front faces integrated into steel frame construction. A LSE front grill protects the diffuser face plates.



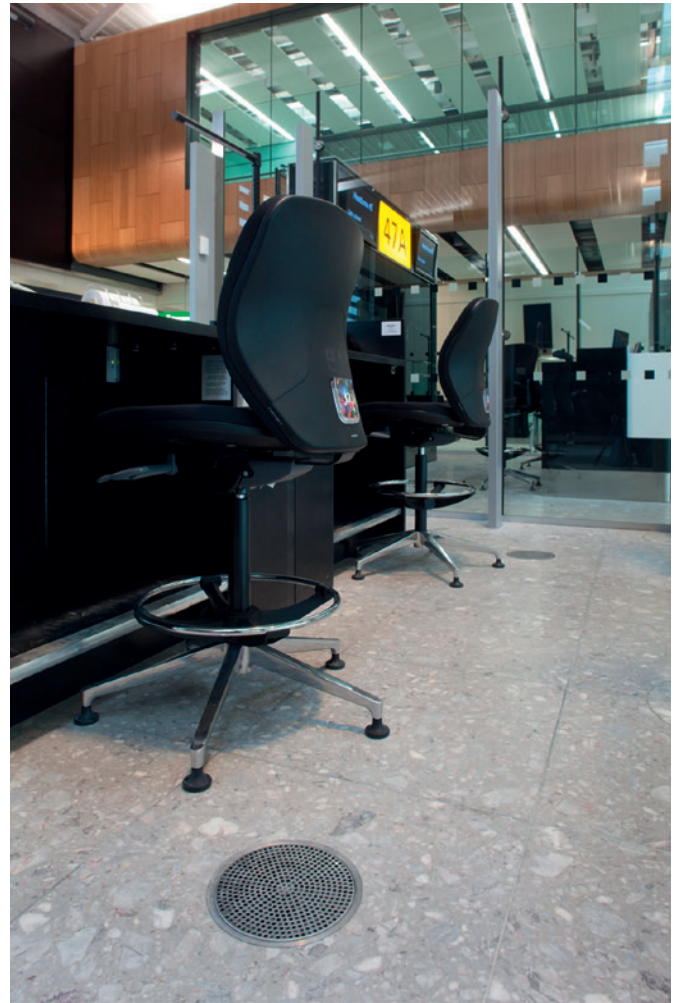
LSE material framed by heavy stainless steel profiles.

Option for floor diffusers

For safety reasons this variation is limited to control rooms in the concourse and the control tower. In public areas this effective system of supplying the air is not permitted. Another problem could be the absence of raised floors in these areas.



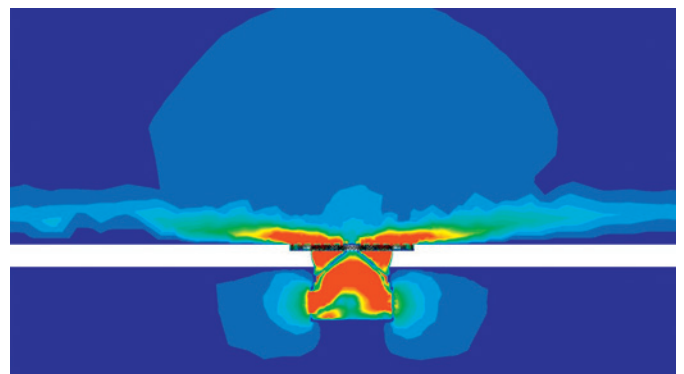
Floor diffuser 200 mm diameter for installation in raised floors. Air is supplied through the raised floor or by plenum. Air flow up to 20 l/s per diffuser. Temperature difference up to 8 K. Visible part from stainless steel. Also available as floor diffuser 250 mm diameter with air flow up to 35 l/s.



Heathrow Airport, London, Terminal T5A



Floor diffusers for medium or heavy loads. Floor diffuser sizes 200/160 and 250/225 in control rooms.



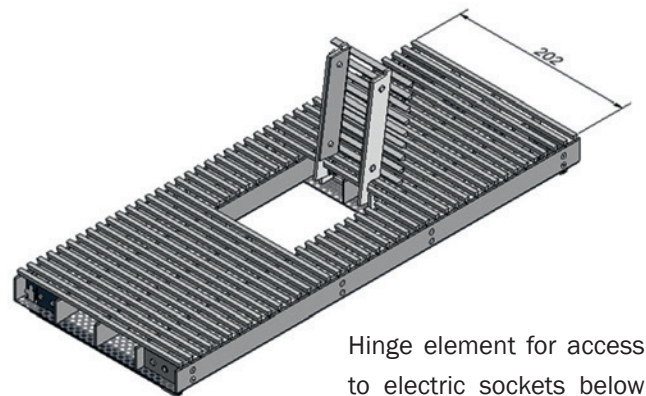
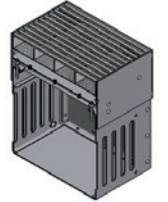
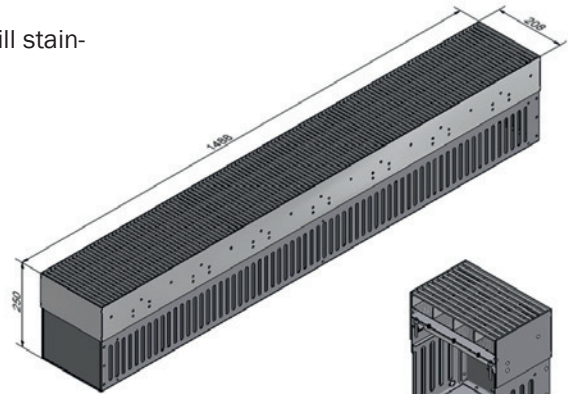
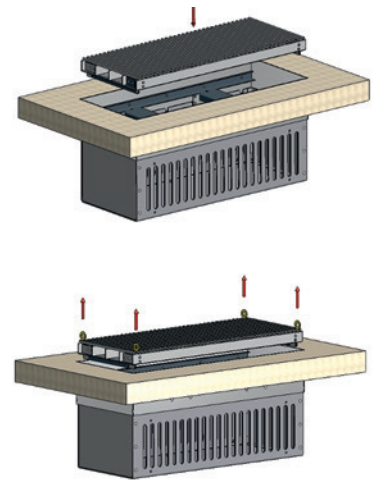
Air flow pattern of Strulik floor diffusers.

Option of linear floor diffusers



Heathrow Airport, London, Pier T2B North

Linear floor diffuser along travelator. Width 200 mm, frame and front grill stainless steel, plenum steel plate zinc coated.



Hinge element for access to electric sockets below the diffuser front grill.



Heathrow Airport, London, Pier T2B

Linear floor diffuser along travelator. Width 200 mm, frame and front grill stainless steel, plenum steel plate zinc coated.



Heathrow Airport, London, Terminal Pier T2B North

Linear floor diffusers under balustrades, width 400 mm.



Heathrow Airport, London, Terminal Pier T2B North

Linear floor diffusers under balustrades, width 200 mm.

Linear floor diffusers in front of glass façade, width 250 mm.



Heathrow Airport, London, Terminal Pier T2B North



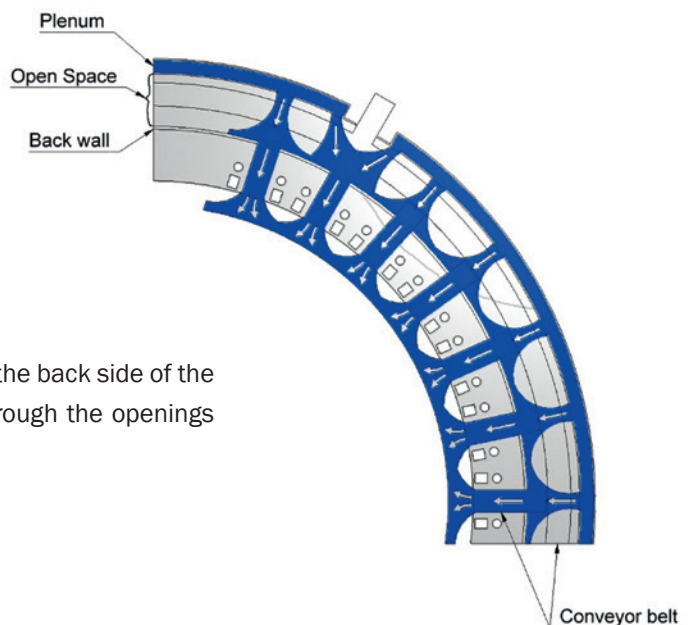
Option for specific solutions

An indirect way of supplying the air to the check-in counter staff and the queuing passengers in front of the counter was selected. In these areas, North and South check-in T5A, the diffusers were installed in a room on the back side of the counter area and the air is supplied through the opening for the baggage conveyor belts. A CFD study was employed to ensure proper performance.



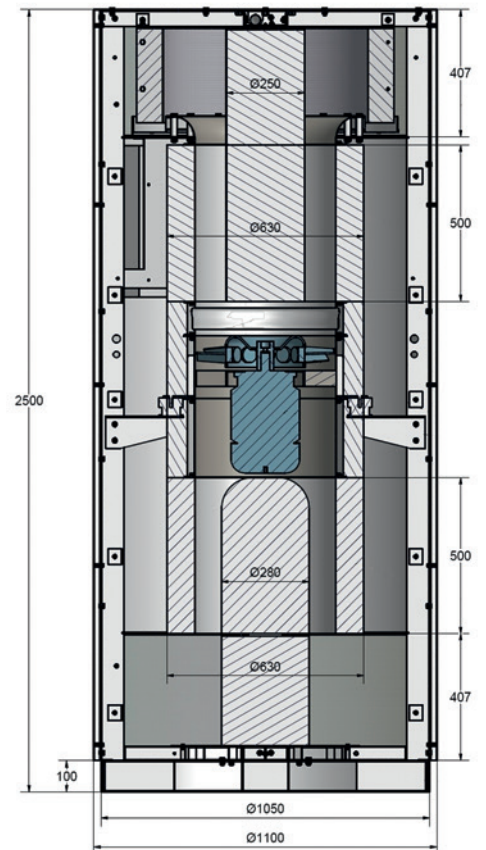
Heathrow Airport, London, Terminal T5A

Indirect way of supplying the air to check-in counter staff and the queuing passengers in front of the counter.



The diffusers are installed in a room on the back side of the counter area and the air is supplied through the openings for the baggage conveyor belt.

Free standing recirculation air cooling unit



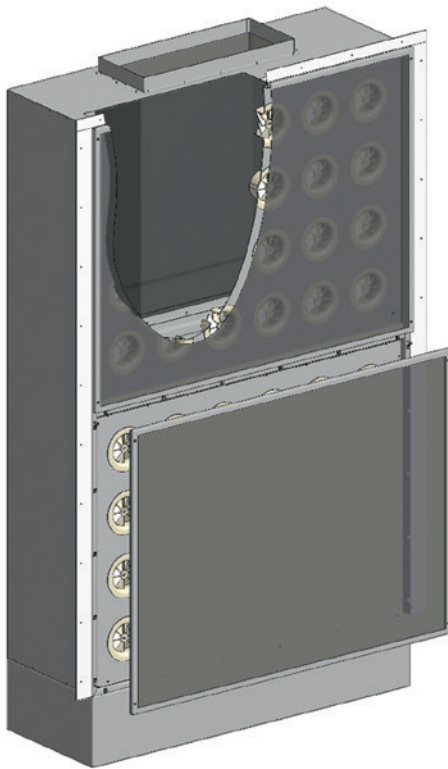
Free standing cooling unit with 13 kW cooling capacity. Air flow 1.100 l/s. Sound pressure 49 dB(A). Diameter: 1,1 m, height: 2,5 m. Material: stainless steel, blasted.

Cooling unit with fan, water chiller, filter and special silencer.



Strasbourg Main Station, France

Option for installation of in-wall induction displacement diffusers



The outer appearance of induction displacement diffusers does not differ from normal displacement diffusers. The different construction however allows the units to run temperature differences up to 8-10 K.

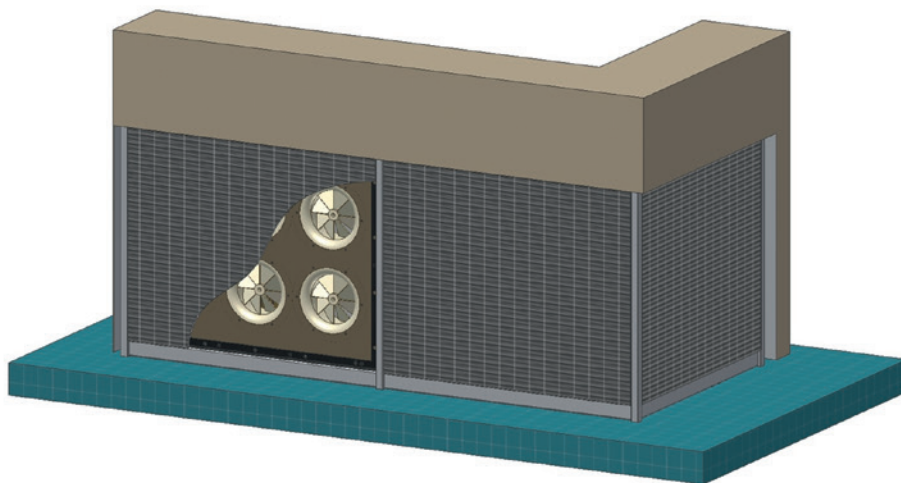
In-wall diffuser as induction displacement diffuser.



Heathrow Airport, London, Terminal T5A

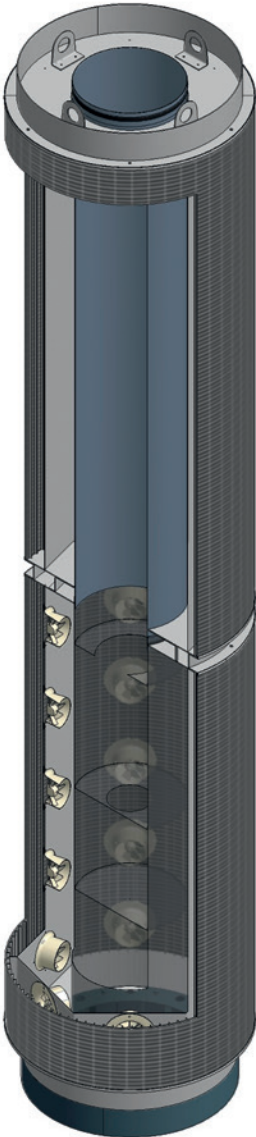
Integration of induction displacement diffusers into furniture

Reception desk counter with induction displacement diffusers in the front. Active front face with swirl diffusers, decorative front face from stainless steel LSE grill.



Heathrow Airport, London, Terminal T5B,
BA CIP Lounge

Column diffusers as induction displacement diffusers

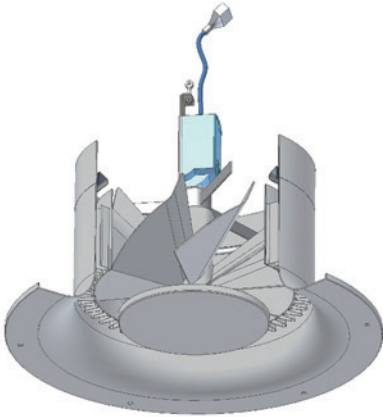


Column diffuser as induction displacement diffuser build as a combined functional and design element. 750 mm diameter, height 3500 mm. Height of active part: 1500 mm. Air is supplied from the ceiling.



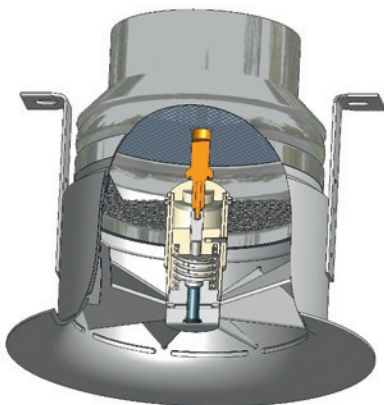
Heathrow Airport, London, Terminal T5B,
BA CIP Lounge

Option for ceiling diffusers for heating and cooling (mounting heights from 3 to 10 m)



Variable swirl diffusers, size 400, Dresden Airport

Variable swirl diffuser for installation between 3 and 10 m, 15 K cooling and 15 K heating. Air flows between 500 and 2000 m³/h. Adjustable by hand, self-regulating element or servo motor. Low sound power level and constant pressure loss in any position.



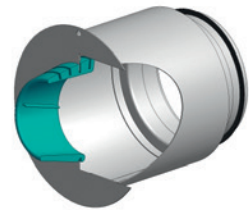
Heathrow Airport, London, Underground platforms Terminal 5

Variable swirl diffuser for heating and cooling. Mounting height 2,5 to 5 m. Air flow between 50 and 300 m³/h. Adjustable by hand or self-regulating element.

Option for wall diffusers

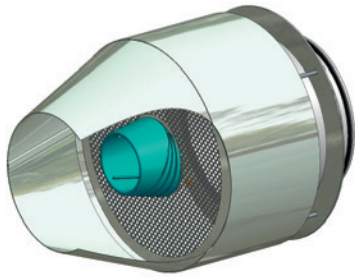


Rubber jet nozzles size 70 mm, recessed and mounted into an aluminium profile construction.

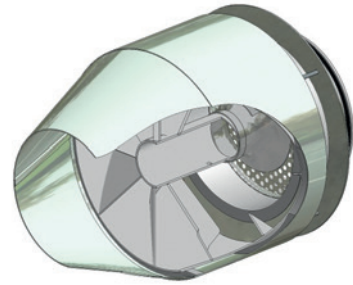


Adjustable rubber jet nozzle, available from size 25 to 160 mm.

Heathrow Airport, London, Terminal 5A



Jet nozzle configuration with adjustable rubber nozzle and displacement section. Horizontal throw can be adjusted by adaptation of jet nozzle and displacement section.



Jet nozzle configuration with integrated swirl diffuser for short horizontal throws and bigger air flows.



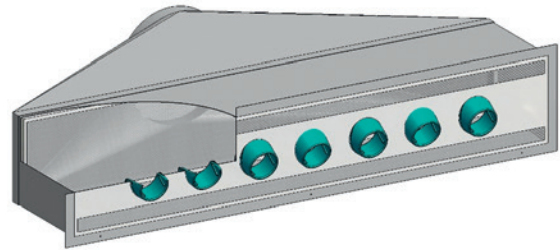
Heathrow Airport, London, Terminal 5 TTS Area



Heathrow Airport, London, Terminal 5 TTS Area



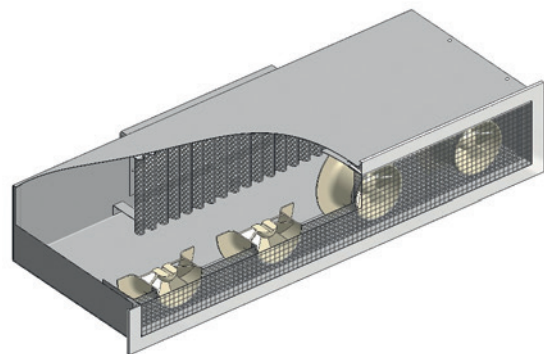
Heathrow Airport, London, Terminal 5A



Multi-jet nozzle diffuser with displacement section, installed at a distance of 4 m from the North and South façade to warm up the glass façade and to reduce the downdraft effect of the cool air at the façade.



Heathrow Airport, London, Terminal 5 TTS Area



Multi swirl nozzle diffuser with displacement section and special perforated front face. Used for cooling up to 10 K and heating up to 6 K.



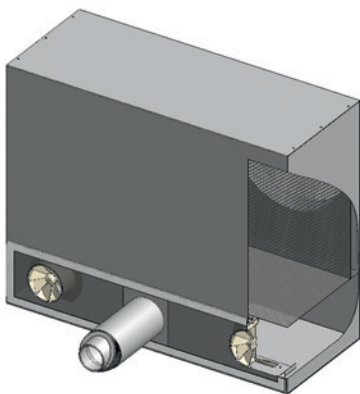
London Heathrow Airport, Underground Walkways at Terminal 5 A, B and C



Fixed air pattern ceiling diffuser for mixing systems, size 675 x 188 x 225 mm.
Airflow/unit 100l/s or 360 m³/s.

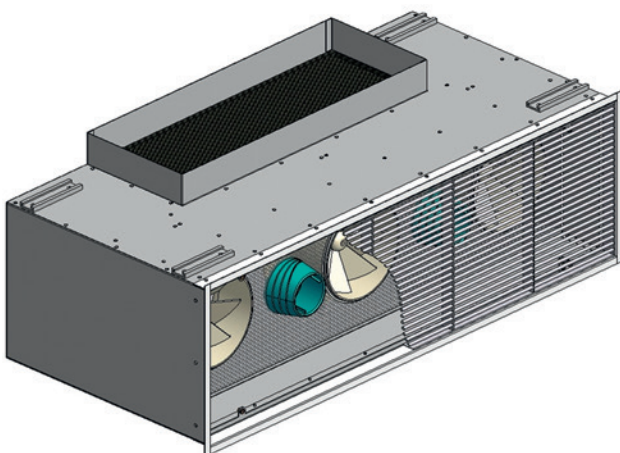


Munich Airport, Terminal 2, passport control and security control areas



Wall diffusers for heating and cooling up to 10 K and for installation behind the design front grill supplied by the building contractor. Diffuser consisting of rubber nozzle, swirl nozzle and displacement section.

Air flow about 600 m³/h.



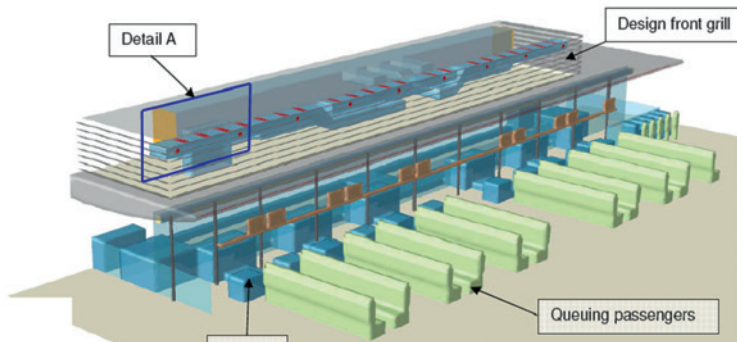
Linear wall diffuser for heating and cooling with integrated wire front grill. Active diffuser front face with rubber jet nozzles, swirl nozzles and displacement section.

Installed at Turkmenbasi Airport, Turkmenistan

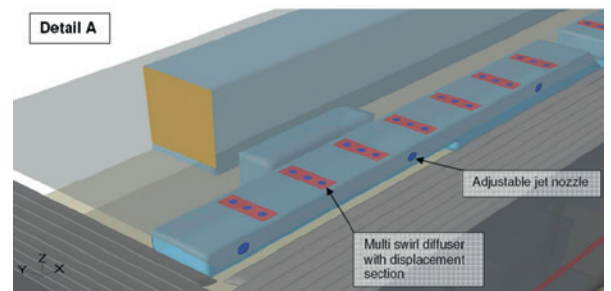


Airport Munich, check-in area

Wall diffuser system built of jet nozzles in combination with multi-swirl diffusers.



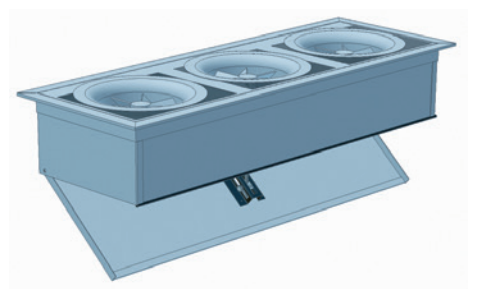
Positioning of jet nozzles and multi-swirl diffusers



Detail A for positioning of jet nozzles and multi-swirl diffusers



Installation of multi-swirl diffusers in the top side of the supply duct.



Multi-swirl diffusers with swirl diffusers of different swirl direction (for creating a horizontal air flow pattern) integrated into a displacement section.

Stuttgart Airport Terminal 3	<ul style="list-style-type: none"> ▪ Involved in the development process of architectural design by Gerkan, Marg und Partner, Hamburg (architects) ▪ Design assistance for IGH, Stuttgart (design engineers) ▪ Appointed as supplier of the complete displacement diffusers (see Airport reference leaflet)
Munich Airport Terminal 2 (Check-in and security area)	<ul style="list-style-type: none"> ▪ Introduced to the project by GTD Dresden, who revised the original design. ▪ Development of special WSA type diffusers and combined wall diffusers after CFD flow studies and testing of prototypes ▪ Supply of the designed diffusers (see Airport reference leaflet)
Rotterdam Airport	<ul style="list-style-type: none"> ▪ Assistance to the design engineering office ▪ Development of displacement diffusers according to architectural requirements (see Airport reference leaflet)
Orly Airport, Paris	<ul style="list-style-type: none"> ▪ Enquiry by the airport operating company for supplying 1000 diffusers for installation in front of the facade through STIK (French subsidiary company of Strulik) ▪ Manufacturing and supply of the redesigned diffusers by Strulik.
Heathrow Airport Terminal 5A and B, London	<ul style="list-style-type: none"> ▪ Design contract by AMEC for designing the displacement diffusers for Terminal 5A ▪ Investigation of the ventilation for all four facades and supply of diffusers for the north and south facades ▪ Design of all displacement diffusers based on the air flow calculation by Arup ▪ Supply of displacement after manufacturing of mock ups and performance of CFD studies ▪ Follow-up orders e.g. for control rooms, the Mc Kinsey office, jet diffusers for the Terminal 5B staircase, the Track Transit System and design and supply of diffusers for the BAA's (formerly British Airports Authority) CIP Lounge in Terminal 5B
Heathrow Airport Terminal T5, London	<ul style="list-style-type: none"> ▪ Design and Supply of wall-in displacement diffusers for security screenings area ▪ Design and supply of new IDL diffusers an arrivals level ▪ Design of displacement ventilation system for new first class check in area on departures level
Heathrow Airport Terminal 5C, London	<ul style="list-style-type: none"> ▪ Assistance in the predesign of the displacement system to WSP (design engineers) ▪ Assigned by Carillion to give design assistance to DSSR (consulting engineers, definition of air flows, type and location of the diffusers) ▪ Design of prototypes together with Pascall & Watson (architects) ▪ Manufacturing and testing of prototypes ▪ Verification of the designed systems through CFD studies ▪ Supply of diffusers for the departures level ▪ Manufacturing and supply of diffusers for the Track Transit System and the toilets

Heathrow Airport Terminal 2B Phase 1, London	<ul style="list-style-type: none"> ▪ Contract for design assistance by DSSR (consulting engineers) ▪ Assignment for a CFD building simulation to specify air flows, diffuser types and diffuser locations ▪ Verification of the designed system by CFD studies ▪ Manufacturing and supply of all designed diffusers for Balfour & Beatty
Heathrow Airport Terminal T2B Phase 2, London	<ul style="list-style-type: none"> ▪ Contract design assistance, manufacturing and supply of diffusers for Balfour & Beatty
Turkmenbasi Airport, Turkmenistan	<ul style="list-style-type: none"> ▪ Revision of the originally designed system thereby significantly reducing the required air flow ▪ Specification of diffuser locations and definition of four different diffuser types ▪ Manufacturing and supply of the complete designed systems to Polimeks, Istanbul
Gatwick Airport, London, North Terminal	<ul style="list-style-type: none"> ▪ Design of all elliptical displacement diffusers for the refurbished and extended national and international baggage reclaim hall ▪ Manufacturing of mock ups and running of performance tests. ▪ Design and supply of additional diffusers in Baggage reclaim hall ▪ Modification of dummy diffusers into active displacement diffusers
Muscat International Airport	<ul style="list-style-type: none"> ▪ Design of the air distribution system with about 28 different tailor made diffusers for all piers and different parts of the main building, based on the calculations by Cowi-Larsen. ▪ Manufacturing and supply of diffuser for: <ul style="list-style-type: none"> - Check in Area - Arrivals hall - Baggage reclaim - Emigration hall - Staircase lobby - Design of special wall and floor diffusers in piers - Design and supply of ceiling diffusers in 11.5. height in VIP lounges

Contact Strulik

Division Air Diffusion Systems

Am Alten Viehhof 7
47138 Duisburg, Germany

Phone: +49 (0) 203 / 429 46-0

Fax: +49 (0) 203 / 429 46-66

E-mail: duisburg@strulik.com

Kenny Neuhäuser M. Eng.

Divisional Director

E-Mail: k.neuhaeusser@strulik.com

Phone: +49 (0) 203 / 429 46-13

Strulik GmbH

Neesbacher Straße 15
65597 Hünfelden-Dauborn, Germany

Phone: +49 (0) 6438 / 839-0
E-mail: contact@strulik.com
Web: www.strulik.com

Division Air Diffusion Systems

Am Alten Viehhof 7
47138 Duisburg, Germany

Phone: +49 (0) 203 / 429 46-0
E-mail: duisburg@strulik.com

Subject to technical changes!
© 2020 Strulik GmbH

